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DEPARTMENT OF THE NAVY NAVY EXPERIMENTAL DIVING UNIT 321 BULLFINCH ROAD

321 BULLFINCH ROAD PANAMA CITY, FLORIDA 32407-7015

IN REPLY REFER TO:

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NAVY EXPERIMENTAL DIVING UNIT

TECHNICAL REPORT NO. 11-94

TEST AND EVALUATION OF THE INTEGRATED DIVERS VEST (UNMANNED)

LTJG TREVOR RUSH

JUNE 1994

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REPORT DOCUMENTATION PAGE 1a. REPORT SECURITY CLASSIFICATION 1b. RESTRICTIVE MARKINGS 2a. SECURITY CLASSIFICATION AUTAORITY 3. DISTRIBUTION/AVAILABILITY OF REPORT 2b. DECLASSIFICATION AUTAORITY 3. DISTRIBUTION/AVAILABILITY OF REPORT 2b. DECLASSIFICATION AUTAORITY 3. DISTRIBUTION FATCHER A: Approved for public release; 4. PERCONTING CRAMIZATION REPORT NUMBER(S) 5. NONITORING ORGANIZATION REPORT NUMBER(S) 6a. MAR OF PRROMING 6b. OFFICE STREDCI (1f Applicable) 7a. NAME OF NONITORING ORGANIZATION Name OF REPORTING COGMATIZ 6b. OFFICE STREDCI (1f Applicable) 7b. ADDRESS (City, State, and Zip Code) 2b. Land Stream 6b. OFFICE STREDCI (1f Applicable) 7b. ADDRESS (City, State, and Zip Code) 2c. ADDRESS (City, State, and Zip Code) 9. PROCUMENT INSTRUMENT IDENTIFICATION NUMBER 00000000 000000000000000000000000000000000000	_	UNCLASSI SECURITY CLASSIFICA	FIED TION OF THIS	PAGE						
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UNCLASSIFIED SECURITY CLASSIFICATION OF THIS PAGE

CONTENTS

Page No	0	
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TRODUCTION	1
ETHODS	1
SULTS	1
SCUSSION	3
DNCLUSIONS	4

APPENDIX A - Data Collection Sheets	A-1
APPENDIX B - Columbia Research Corporation Letter Report	B-1

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Accesion	n For		1
NTIS	CRA&		I
DTIC	TAB		1
Unanno	unced		
Justifica	ation		-
By Distribu	ition /		_
A	vailabilit	y Codes	
Dist	Avail a Spe	and / or ecial	
A-1			

INTRODUCTION

The Navy Ships Parts Control Center (NSPCC), Quality Assurance Division, periodically conducts random testing on requisitioned material in an effort to validate asset quality. The Divers Vest, NSN 1H 4220-01-045-2194, was selected as a candidate for this program.¹ The vest is manufactured by <u>Morse Diving Equipment</u> <u>Company. Inc.</u>

Twelve units were submitted to the Navy Experimental Diving Unit for evaluation. Evaluation of the vests was based on the manufacturer's compliance with the requirements of MIL-V-24690(SH), MILITARY SPECIFICATION VEST INTEGRATED DIVERS. All twelve vests underwent non-destructive testing. The non-destructive testing consisted of a visual examination to check for defects in design, material, construction, workmanship, color and marking. Also the dimensions of the vests were measured and compared to the specified requirements.²

Two of the twelve vests were used for destructive testing. The destructive testing was done by <u>Columbia Research Corporation, Gulf Coast Division</u> located in Panama City Beach, FL. The following items were submitted to be analyzed:²

- (a) Two tank clamp screws
- (b) One brass buckle
- (c) One stainless steel buckle
- (d) The buckle and ring used to fasten the vest at the waist
- (e) One D-ring
- (f) One section of 1-3/4 inch nylon webbing
- (g) One section of 1-inch nylon webbing

METHODS

The visual examination of the vests was conducted per MIL-V-24690(SH) paragraph 4.5.1.1 and the dimensional examination was conducted per paragraph $4.5.1.2^2$

The metal buckles, screws and rings submitted to <u>Columbia Research Corporation</u> had acid spot tests performed on them for a determination of the material from which they were constructed. One tank screw was subjected to a tensile strength test. The other screw underwent a torque test.³

RESULTS

The data collection sheets from the visual and dimensional examinations are contained in Appendix A. Appendix B holds the report from <u>Columbia Research</u> <u>Corporation</u>'s testing.

Of the items that were sent out for metallurgical analysis, the tank clamp screw, D-ring, frontal closure buckle and buckle and ring assembly from the waist strap all proved to be made of the proper metal. The tank clamp screw that underwent the tensile strength test had an ultimate stress point above the minimum amount required. The torque test conducted on the second screw was unsuccessful because the screw broke into two pieces before a reading could be taken from the meter.^{2,3}

The two sections of nylon webbing were to be tested for breaking load, however there was an insufficient length to obtain results. A minimum of three feet of each type would be required for an accurate test.³ That quantity could only be obtained from a bulk load of the webbing prior to vest assembly.

Listed below are the discrepancies found during the non-destructive and destructive testing. The vests were numbered 8 - 19 so as not to be confused with previously numbered vests at NEDU.

(1) MiL-V-24690(SH) stated that the wide webbing used for the harness portion of the vest should be nylon, 1-3/4 inches wide, conforming to class ', type XIII of MIL-W-4088. The thickness of the webbing had a specified range of .080 - .120 inches. An examination with a micrometer showed that the wide webbing on all twelve vests only had a thickness of .050 inches. This would indicate the webbing is a different type than the one specified.

(2) MIL-V-24690(SH) paragraph 3.3.8 states that the buckle used to adjust and secure the shoulder, chest, and waist strap shall be made of brass. Paragraph 3.4 goes on to say that these buckles should be "rustproof". The buckles on the twelve vests do not meet these specifications. The report received from <u>Colombia Research</u> <u>Corporation</u> states that the buckles are made of steel. In the areas where the outer coating was scraped away for testing, the buckles are now visibly rusting.

(3) On each of the twelve vests, there were cases in which the wide nylon webbing was insufficiently fused at the ends. This is primarily due to the stitching that runs down the middle of the wide webbing. Improperly fused ends are listed as a defect in Table III of MIL-V-24690(SH).

(4) Table II of MIL-V-24690(SH) contained the finished measurements for the shoulder, sides, crotch, and front closure straps. The tolerance for all the measurements was plus 1/2 inch. Not one of the twelve vests met the specifications. The crotch straps were all more than one inch short. The left shoulder and right shoulder straps were never the same length, and all the shoulder straps were more than the required length; several, in fact, were in excess of two inches beyond the specifications. There were many more discrepancies in the remaining straps, and these can be seen from the data collection sheets found in Appendix A.

(5) All twelve vests were missing the elastic band loop on the left front portion of the vest used to secure the buckle assembly for the waist strap. A piece of elastic webbing was found in the general area on all the vests, however in each case it was assembled incorrectly. The elastic webbing was stitched at only one end and lay parallel with the waist strap. Instead, it should have been perpendicular to the waist strap, with one end stitched underneath so that the webbing could be passed over the waist strap and then have the second end stitched underneath, thus forming a loop used to secure the buckle. The current elastic piece can not perform the specified task.⁴

(6) A number of the vests had poorly stitched weight pockets. Loose ends of thread could be easily pulled by an examiner, causing the stitching to unravel. This is due to improper backstitching or overstitching, as well as improperly trimmed ends of thread. Both are listed as defects in Table III of MIL-V-24690(SH).

(7) On vest number 9, the tank retainer strap was not properly assembled. The nylon webbing had been twisted before it was sewn together. On vest number 13, the loop hole on the left side tank retainer strap was not big enough to fit over the metal tank clamp band. This makes the retainer strap unusable.

DISCUSSION

The results listed above show clearly that the manufacturer has not satisfied many of the specific criteria established in MIL-V-24690(SH) or the contract. Along with those discrepancies noted in the results, there were several other problems found that the military specifications do not clearly deal with.

The first is the elastic material that is used to secure straps. The material and construction fell within the appropriate mil-spec (MIL-W-5664), however, the examiners found that the ends frayed easily. In fact, in most cases, numerous threads could be pulled from the ends. It is not required to have a secured or fused end for the elastic webbing, but it is felt that such easy fraying could lead to premature wear and tear.

Next, the tank retainer strap is not big enough to hold an aluminum 80 SCUBA tank. It was designed for use only with the steel 72 tanks. This could cause increased problems in the future when dive lockers can no longer acquire the steel 72 cylinders. In conjunction with the size of the tank retainer strap, there have been complaints from the fleet concerning the material from which it is made. The 1-inch nylon is extremely thin and does not require much abrasion before it parts (i.e. from rubbing on a non-skid deck surface).

Finally, all twelve vests were delivered unassembled. Total assembly is not discussed in MIL-V-24690(SH) or the contract, however had NEDU wished to do manned testing of the vests, the two nylon pieces that make up the back of the vest

3

would have had to be stitched together around the tank clamp assembly. Also, a way to attach the rubber covering to the tank band would have had to be devised. The covering was supposed to be removable, but in this case there was no way to secure the covering to the tank band on any of the twelve vests.

CONCLUSIONS

Based on the visual examinations, dimensional measurements, and the testing done by <u>Columbia Research Corporation</u>, the Divers Vest, NSN 1H 4220-01-045-2194, fails to meet the standards set forth in the military specification, MIL-V-24690(SH) or as outlined in the contract.

REFERENCES

- 1. Eugene Hoey, Letter from Commanding Officer, Navy Ships Parts Control Center (03431) to Commander, Naval Sea Systems Command. Subject: Divers Vest. 08 March 1994.
- 2. Integrated Divers Vest Test and Evaluation, NEDU Test Plan Number 94-18, May 1994.
- 3. Richard Diamond, Columbia Research Corporation Letter Report on Divers Vest Materials, #94/50/173/ 4334, 27 May 1994.
- 4. *Military Specification, Vest Integrated Divers*, MIL-V-24690(SH), 28 September 1987.

APPENDIX A

DATA COLLECTION SHEETS

INSTRUCTIONS

1. The vest shall be examined for defects in design, material, construction, workmanship, color and marking in accordance with Table I, Annex A.

2. The vest shall be examined for conformance to the dimensions specified in Table II, Annex A. Any dimensions not meeting the specified requirements shall be classified as a defect.

SERIAL NO. OF VEST: <u>#8</u> DEFECTS: * NYLON, CLOTH COATED- * WEBBING, BRAID AND TAPE- <u>Elastic strop near waist buckle fraying</u> * SEAM AND STITCHING- <u>Loose stituling on buckside of left front</u> * HARDWARE (BUCKLES, D-RINGS, RINGS, BACKPLATE) -
DEFECTS: * NYLON, CLOTH COATED- * WEBBING, BRAID AND TAPE- Elastic strap near waist buckle fraying * SEAM AND STITCHING- Loose stitching on backside of left front * HARDWARE (BUCKLES, D-RINGS, RINGS, BACKPLATE)-
* NYLON, CLOTH COATED * WEBBING, BRAID AND TAPE- <u>Elastic strop near waist buckle fraying</u> * SEAM AND STITCHING- <u>Loose stitching on buckside of left fron</u> t * HARDWARE (BUCKLES, D-RINGS, RINGS, BACKPLATE)-
* WEBBING, BRAID AND TAPE- <u>Elastic strop near waist buckle fraging</u> * SEAM AND STITCHING- <u>Loose stitching on buckside of left front</u> * HARDWARE (BUCKLES, D-RINGS, RINGS, BACKPLATE) -
* SEAM AND STITCHING- <u>Loose stitching on backside of left front</u> * HARDWARE (BUCKLES, D-RINGS, RINGS, BACKPLATE) -
* HARDWARE (BUCKLES, D-RINGS, RINGS, BACKPLATE) -
* THREAD
* COMPONENTS AMD ASSEMBLY-
* LABEL-
* CLEANNESS- <u>3 thread ends not trimmed properly on left & right</u> front
MEASUREMENTS :
LEFT SHOULDER: 201/2" RIGHT SHOULDER: 19"
RIGHT SIDE , TOP: $\underline{\rho}^{\prime}$ LEFT SIDE, BOTTOM: $\underline{17}^{\prime}$ RIGHT SIDE, BOTTOM: $\underline{17}^{\prime}$
LEFT "V": $10^{3/4^{\circ}}$ //" RIGHT "V": $10^{2/4^{\circ}}$ CROTCH: CROTCH:
FRONT CLOSURE, TOP: 10 7/8" FRONT CLOSURE, MIDDLE: 7/2"

ever A Ruch ENS, USN **INSPECTOR:**

INSTRUCTIONS

The vest shall be examined for defects in design, material, 1. construction, workmanship, color and marking in accordance with Table I, Annex A.

2. The vest shall be examined for conformance to the dimensions specified in Table II, Annex A. Any dimensions not meeting the specified requirements shall be classified as a defect.

SERIAL NO. OF VEST: #9 **DEFECTS**: * NYLON, CLOTH COATED-* WEBBING, BRAID AND TAPE- <u>E lastic webbing at waist fraying</u>, also at shoulder strop (left + right side) * SEAM AND STITCHING- <u>stitching</u>, bottom middle pocket on right side in top right hand corner * HARDWARE (BUCKLES, D-RINGS, RINGS, BACKFLATE) -* THREAD-* COMPONENTS AND ASSEMBLY - Tank retainer strap not properly assembled * LABEL-* CLEANNESS-**MEASUREMENTS:** LEFT SHOULDER: 20³/8["] LEFT SIDE, TOP: 18⁴/2" RIGHT SIDE, TOP: 19⁴/4" RIGHT SHOULDER: 187/8" LEFT SIDE, BOTTOM: 193/8" RIGHT SIDE, BOTTOM: 18" RIGHT "V": 103/4"

CROTCH:

FRONT CLOSURE, MIDDLE: 75/A"

INSPECTOR:	- A. high	ENS, USN
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FRONT CLOSURE, TOP: 101/4" FRONT CLOSURE, BOTTOM: 7 5/4"

INSTRUCTIONS

1. The vest shall be examined for defects in design, material, construction, workmanship, color and marking in accordance with Table I, Annex A.

2. The vest shall be examined for conformance to the dimensions specified in Table II, Annex A. Any dimensions not meeting the specified requirements shall be classified as a defect.

SERIAL	NO.	OF	VEST	:	10	

DEFECTS :

* NYLON, CLOTH COATED-

* WEBBING, BRAID AND TAPE-

* SEAM AND STITCHING- loose stitching on Left Front

* HARDWARE (BUCKLES, D-RINGS, RINGS, BACKPLATE) -

* THREAD-

* COMPONENTS AMD ASSEMBLY-

- * LABEL-
- * CLEANNESS-

LEFT SHOULDER: $20/4$ LEFT SIDE, TOP: $55/3$ RIGHT SIDE, TOP: $55/3$ LEFT "V": $07/3$ CROTCH: $28/3$ FRONT CLOSURE, TOP: 1 FRONT CLOSURE, BOTTOM: $7/2$	RIGHT SHOULDER: 1918 LEFT SIDE, BOTTOM: 1819 RIGHT SIDE, BOTTOM: 1734 RIGHT "V": 1074 CROTCH: FRONT CLOSURE, MIDDLE: 774
INSPECTOR: TASS	

INSTRUCTIONS

1. The vest shall be examined for defects in design, material, construction, workmanship, color and marking in accordance with Table I, Annex A.

2. The vest shall be examined for conformance to the dimensions specified in Table II, Annex A. Any dimensions not meeting the specified requirements shall be classified as a defect.

SERIAL NO. OF VEST: # []
DEFECTS :
* NYLON, CLOTH COATED-
* WEBBING, BRAID AND TAPE-
* SEAM AND STITCHING- Left top front pocket overstitzlud sloppily
* HARDWARE (BUCKLES, D-RINGS, RINGS, BACKPLATE)-
* THREAD-
* COMPONENTS AMD ASSEMBLY-
~~~~~
* LABEL-
* CLEANNESS-

LEFT SHOULDER: $20^{4}$ LEFT SIDE, TOP: <u>18 76</u> RIGHT SIDE, TOP: <u>18 76</u> LEFT "V": <u>10 76</u> CROTCH: 28 76"	RIGHT SHOULDER: $[9"$ LEFT SIDE, BOTTOM: $19%"RIGHT SIDE, BOTTOM: 1634"RIGHT "V": 103/4"CROTCH:$
FRONT CLOSURE, TOP: (( FRONT CLOSURE, BOTTOM: 7/2"	FRONT CLOSURE, MIDDLE: 7-38"
INSPECTOR for A. Ruch	ENSUSU

### INSTRUCTIONS

1. The vest shall be examined for defects in design, material, construction, workmanship, color and marking in accordance with Table I, Annex A.

2. The vest shall be examined for conformance to the dimensions specified in Table II, Annex A. Any dimensions not meeting the specified requirements shall be classified as a defect.

SERIAL NO. OF VEST: 12

DEFECTS :

* NYLON, CLOTH COATED-

* WEBBING, BRAID AND TAP	- LEFT FRONT TOP STRAP	NOT FUSED PROPERLY
Crotch strap not fused pro	erly	

_____

* SEAM AND STITCHING- Kight side front loose stitching on majority of Weight Packets.

* HARDWARE (BUCKLES, D-RINGS, RINGS, BACKPLATE) - _____

* THREAD-_____

* COMPONENTS AMD ASSEMBLY-

* LABEL-

* CLEANNESS-

LEFT SHOULDER: 2014 LEFT SIDE, TOP: 87/8 RIGHT SIDE, TOP: 87/8 LEFT "V": 07% CROTCH: 281/2 FRONT CLOSURE; TOP: 11/8 FRONT CLOSURE; BOTTOM: 75/8	RIGHT SHOULDER: 1874 LEFT SIDE, BOTTOM: 1974 RIGHT SIDE, BOTTOM: 1772 RIGHT "V": 078 CROTCH: 778 FRONT CLOSURE, MIDDLE:
INSPECTOR: TASS	

#### **INSTRUCTIONS**

1. The vest shall be examined for defects in design, material, construction, workmanship, color and marking in accordance with Table I, Annex A.

2. The vest shall be examined for conformance to the dimensions specified in Table II, Annex A. Any dimensions not meeting the specified requirements shall be classified as a defect.

# SERIAL NO. OF VEST: (3

#### DEFECTS:

* NYLON, CLOTH COATED-

* WEBBING, BRAID AND TAPE- Left side whist strap not fused properly Right Shoulder Strap not fused properly; crotch Str. net tuded properly

* SEAM AND STITCHING- Left side, bottom outside packet: bud stitching on flap;

* HARDWARE (BUCKLES, D-RINGS, RINGS, BACKPLATE)-

* THREAD-_____

* COMPONENTS AND ASSEMBLY- Touk retainer strap loop holes not big enough to fit easily oner tank clamp. Left side doesn't even fit at all.

* LABEL-

* CLEANNESS-

LEFT SHOULDER: $20^{"}$ LEFT SIDE, TOP: $10^{?}/4^{"}$ RIGHT SIDE, TOP: $10^{?}/4^{"}$ LEFT "V": $10^{1}/7^{"}$ CROTCH: $30^{1}/4^{"}$ FRONT CLOSURE, TOP: $10^{?}/8^{"}$ FRONT CLOSURE, BOTTOM: $3^{3}/4^{'}$	RIGHT SHOULDER: (850" LEFT SIDE, BOTTOM: 1942" RIGHT SIDE, BOTTOM: 1944" RIGHT "V": 1058" CROTCH: FRONT CLOSURE, MIDDLE: 256"
INSPECTOR: JUNA A. Rush, EN	<u>US</u> , USU

#### INSTRUCTIONS

1. The vest shall be examined for defects in design, material, construction, workmanship, color and marking in accordance with Table I, Annex A.

2. The vest shall be examined for conformance to the dimensions specified in Table II, Annex A. Any dimensions not meeting the specified requirements shall be classified as a defect.

SERIAL	NO.	OF	VEST:	
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1.1

**DEFECTS**:

* NYLON, CLOTH COATED-

* WEBBING, BRAID AND TAPE- ALL WEBBING IMPROPERLY FUSED, AULES APART IN THE MIDDLE.

* SEAM AND STITCHING- LOOSE Stitching on pocket Haps

* HARDWARE (BUCKLES, D-RINGS, RINGS, BACKPLATE)-

* THREAD-_____

* COMPONENTS AMD ASSEMBLY-

* LABEL-

* CLEANNESS-

MEASUREMENTS :	
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LEFT SHOULDER: LEFT SIDE, TOP: 1974 RIGHT SIDE, TOP: 1874 LEFT "V": 076 CROTCH: 2872 FRONT CLOSURE; TOP: 1078 FRONT CLOSURE, BOTTOM: 788	RIGHT SHOULDER: 91/9 LEFT SIDE, BOTTOM: 978 RIGHT SIDE, BOTTOM: 13/8 RIGHT "V": 103/4 CROTCH: FRONT CLOSURE, MIDDLE: 7/2
INSPECTOR: TASS	

## INSTRUCTIONS

1. The vest shall be examined for defects in design, material, construction, workmanship, color and marking in accordance with Table I, Annex A.

2. The vest shall be examined for conformance to the dimensions specified in Table II, Annex A. Any dimensions not meeting the specified requirements shall be classified as a defect.

SERIAL NO. OF VEST:	
DEFECTS :	
* NYLON, CLOTH COATED-	
* WEBBING, BRAID AND TAPE- Fused and waist stap-left side; and right and crotch strap; and right shoulder	fsile;
* SEAM AND STITCHING- Flop on pocket, left Side top; fight side - bettom atsile packet	
* HARDWARE (BUCKLES, D-RINGS, RINGS, BACKPLATE)-	
* THREAD	
* COMPONENTS AMD ASSEMBLY-	
* LABEL-	
* CLEANNESS	

LEFT SHOULDER: $20^{4}$ LEFT SIDE, TOP: $18^{4}$ RIGHT SIDE, TOP: $19^{4}$ LEFT "V": $10^{7}/8^{4}$ CROTCH: $28^{7}/2^{4}$ FRONT CLOSURE; TOP: $10^{-14}$ FRONT CLOSURE, BOTTOM: $7^{7}/2$	RIGHT SHOULDER: <u>198</u> LEFT SIDE, BOTTOM: <u>194</u> " RIGHT SIDE, BOTTOM: <u>194</u> " RIGHT "V": <u>104</u> " CROTCH: FRONT CLOSURE, MIDDLE: <u>74</u> "
INSPECTOR: 4. Ruch	ENS,USU

## **INSTRUCTIONS**

1. The vest shall be examined for defects in design, material, construction, workmanship, color and marking in accordance with Table I, Annex A.

2. The vest shall be examined for conformance to the dimensions specified in Table II, Annex A. Any dimensions not meeting the specified requirements shall be classified as a defect.

SERIAL NO. OF VEST:

DEFECTS :

* NYLON, CLOTH COATED- _____

* WEBBING, BRAID AND TAPE ALLINEBBING IMPROPERLY FUSED

* SEAM AND STITCHING-

* HARDWARE (BUCKLES, D-RINGS, RINGS, BACKPLATE) - _____

* THREAD-

* COMPONENTS AMD ASSEMBLY-

* LABEL-

* CLEANNESS-_____

LEFT SHOULDER: $20/2$ LEFT SIDE, TOP: $87/4$ RIGHT SIDE, TOP: $83/4$ LEFT "V": $03/4$ CROTCH: $287/4$ FRONT CLOSURE; TOP: $03/4$ FRONT CLOSURE, BOTTOM: $27/4$	RIGHT SHOULDER: 1812 LEFT SIDE, BOTTOM: 1917 RIGHT SIDE, BOTTOM: 1937 RIGHT "V": 1012 CROTCH: FRONT CLOSURE, MIDDLE: 75/2
INSPECTOR: TASS	

# INSTRUCTIONS

1. The vest shall be examined for defects in design, material, construction, workmanship, color and marking in accordance with Table I, Annex A.

2. The vest shall be examined for conformance to the dimensions specified in Table II, Annex A. Any dimensions not meeting the specified requirements shall be classified as a defect.

SERIAL NO. OF VEST: 17
DEFECTS:
* NYLON, CLOTH COATED-
* WEBBING, BRAID AND TAPE- Inside ~ webbing for neek ring-fusing bad; left Shoulder Strap - Fusing; right waist stopp
* SEAM AND STITCHING- <u>Back pocket - night Side</u>
* HARDWARE (BUCKLES, D-RINGS, RINGS, BACKPLATE)
* THREAD
* COMPONENTS AMD ASSEMBLY-
* LABEL-
* CLEANNESS-

LEFT SHOULDER: 20	RIGHT SHOULDER: 19'8"
LEFT SIDE, TOP: 18/2"	LEFT SIDE, BOTTOM: 1944"
RIGHT SIDE, TOP: 19 44"	RIGHT SIDE, BOTTOM: ''
LEFT "V": 1034"	RIGHT "V": 10'2"
CROTCH: 28'2"	CROTCH:
FRONT CLOSURE; TOP: 107/8"	FRONT CLOSURE, MIDDLE: 7 3/4"
FRONT CLOSURE, BOTTOM: 75/8"	
INSPECTOR: There Alush	ENS.USN

#### INSTRUCTIONS

1. The vest shall be examined for defects in design, material, construction, workmanship, color and marking in accordance with Table I, Annex A.

2. The vest shall be examined for conformance to the dimensions specified in Table II, Annex A. Any dimensions not meeting the specified requirements shall be classified as a defect.

SERIAL NO. OF V	<u>'EST</u> : <u>[</u> ]	)
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#### DEFECTS :

* NYLON, CLOTH COATED-

- * WEBBING, BRAID AND TAPE- Splitting in middle of webbing
- * SEAM AND STITCHING- stilling loose on pockets

* HARDWARE (BUCKLES, D-RINGS, RINGS, BACKPLATE)-

* THREAD-_____

* COMPONENTS AMD ASSEMBLY-

- * LABEL-
- * CLEANNESS-_____

LEFT SHOULDER: 20/8	RIGHT SHOULDER: 874
LEFT SIDE, TOP: 8/8	LEFT SIDE, BOTTOM: 1978
RIGHT SIDE, TOP: 8/2	RIGHT SIDE, BOTTOM: 1779
LEFT "V": 05/8	RIGHT "V": 102
CROTCH: 23/2	CROTCH:
FRONT CLOSURE, BOTTOM: 75/8	FRONT CLOSURE, MIDDLE: 7379
INSPECTOR: TASS	

## INSTRUCTIONS

1. The vest shall be examined for defects in design, material, construction, workmanship, color and marking in accordance with Table I, Annex A.

2. The vest shall be examined for conformance to the dimensions specified in Table II, Annex A. Any dimensions not meeting the specified requirements shall be classified as a defect.

SERIAL NO. OF VEST: #19
DEFECTS:
* NYLON, CLOTH COATED-
* WEBBING, BRAID AND TAPE- Side Straps fusing (all 4) plus both Shaulders I crotch
* SEAM AND STITCHING- Left back packet flap   left side - bottom inside packet flap - velcus undermats;
* HARDWARE (BUCKLES, D-RINGS, RINGS, BACKPLATE)
* THREAD
* COMPONENTS AMD ASSEMBLY-
* LABEL

LEFT SHOULDER: $20\frac{5}{8}$ LEFT SIDE, TOP: <u>184</u> " RIGHT SIDE, TOP: <u>19</u> " LEFT "V": <u>107</u> " CROTCH: <u>2074</u> " FRONT CLOSURE, TOP: <u>1076</u> " FRONT CLOSURE, BOTTOM: <u>758</u> "	RIGHT SHOULDER: $\frac{19^{4}}{9^{4}}$ LEFT SIDE, BOTTOM: $\frac{19^{4}}{10^{4}}$ RIGHT SIDE, BOTTOM: $\frac{17^{4}}{10^{4}}$ RIGHT "V": $\frac{10^{5}}{8^{6}}$ CROTCH: FRONT CLOSURE, MIDDLE: $\frac{7^{3}}{9^{4}}$
INSPECTOR Juno A. Rish	EUS, USU

# APPENDIX B

COLUMBIA RESEARCH CORPORATION REPORT



Columbia Research Corporation Gulf Coast Division 12310 Back Beach Road Panama City Beach, FL 32407 (904) 234-8817

> May 27, 1994 94/50/173/4334

Navy Experimental Dive Unit 321 Bullfinch Road Panama City, FL 32407-7015

Attn: LCDR Marvin Magill

REF: Contract #N0463A-94-M-0113

Dear Mr. Magill:

The results of acid spot tests conducted in accordance with CRC's AST-01 procedure are shown below.

<u>Material</u>	<u>Results</u>
One tank screw	300 Series Cres
One frontal closure buckle	<b>300 Series Cres</b>
One shoulder buckle	Steel
One buckle and ring assembly from waist strap	300 Series Cres
One D-ring	300 Series Cres

The tank screw submitted for torque test was destroyed during testing. It broke into two pieces prior to getting a reading on the meter. We will be happy to make another attempt at this test if you will provide another sample.

The result of the tensile test on the tank screw is shown below.

Specimen	Area	Ultimate	Ultimate
<b>Identification</b>	<u>(sq.in)</u>	Load (1bs)	<u>Stress (psi)</u>
Bolt	0.0318	3,200	101,000

Regretfully, we were unable to obtain test results on either of the two nylon straps submitted. A minimum of 3 feet of each of these is required for an accurate test. If you can get us a sample of these materials in a 3-foot length or greater we will repeat the test.

Sincerely, COLUMBIA RESEARCH CORPORATION

Richards K. Diamond Test Technician Gulf Coast Division

RKD/ljd

-Twenty-Five Years of Professional Experience-